

Mushrooms



Produced through The Northern Rhode Island Conservation District 's **Providence County Urban Growers Leadership Program**, in partnership with Deane Tempest-Thomas of the **Rhode Island Mycological Society** and Michael Del Rio of **The Farm School**.



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Mighty Mycelium



Sascha Vancauwemberg/Getty Images



Mycelium is a white root-like structure of fungus that spreads underground in the soil in search of food. It can be in soil, within wood or any other organic matter.

Mycorrhizal fungi, **myco** meaning mushroom and **rhizal** meaning root, are the fungi that are attached and sometimes within the rootlets of plants and trees.

ALL fungi is made of filamentous cells that are called hyphae, this hyphae is the body of the fungus, as it aggregates it becomes a large network, weblike that can be visible- called mycelium.



*Hyphae Cells
Wikicommons*



Chico State

*Image courtesy of
Chico State University*

The fungus in the soil work together with plant roots to transport nutrients and information across a large underground network in the soil. Fungi are able to secrete enzymes which can break down minerals and digest that for their own consumption.

These broken down minerals then become available for plants to intake for themselves as well.

The world of mycelium is a relatively new topic of research, and there is much more work to be done to find out how exactly it all works. However, research we do have on the network of mycelium currently suggests that it also allows plants to communicate to one another through it.

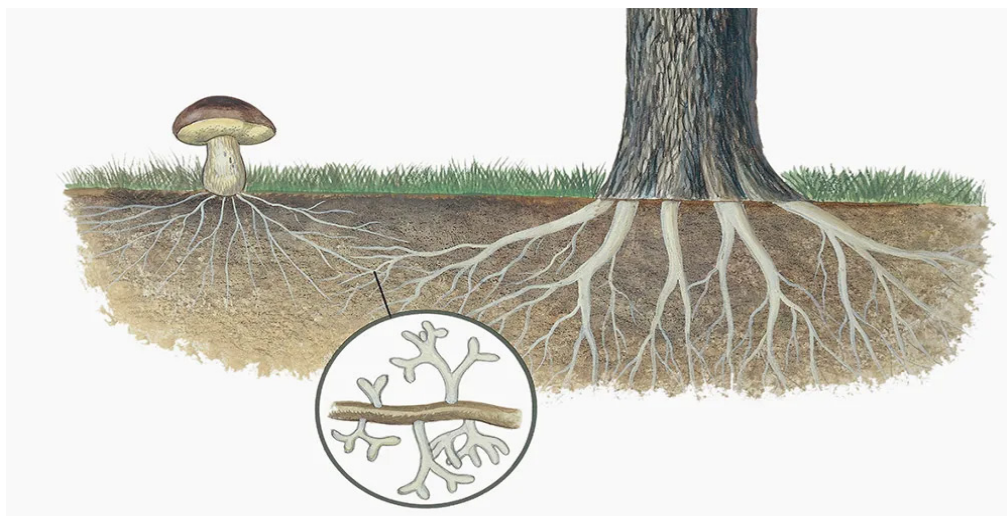


Image courtesy of De Agostini via Getty Images

For example, if a tree is getting eaten by a caterpillar infestation, it can send signals through its roots and the mycelium threads share the information to other trees nearby.

These other trees then activate their own immune response. They prepare their defenses against the caterpillars by releasing bitter tannins in their leaves that the caterpillars do not like.



Image courtesy of Ingrid Taylor

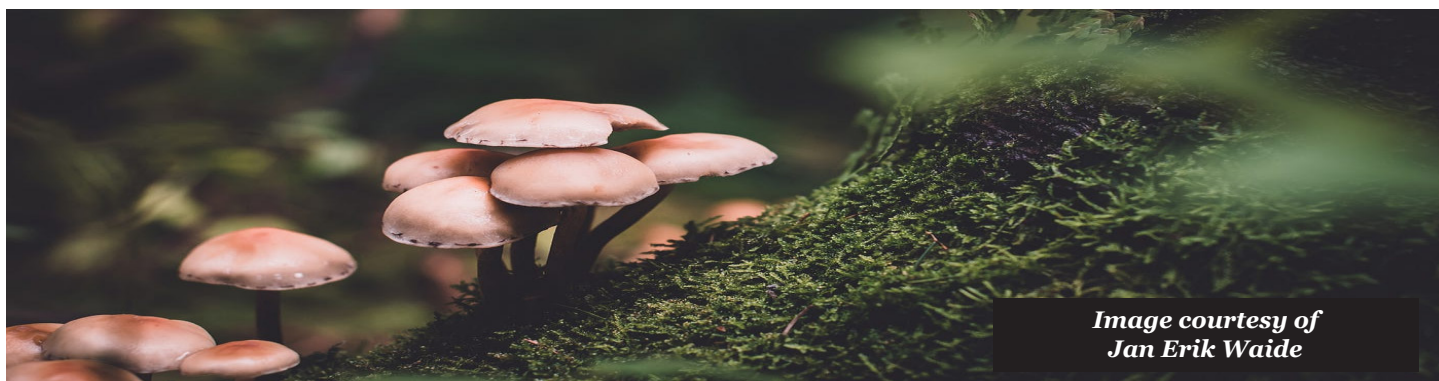


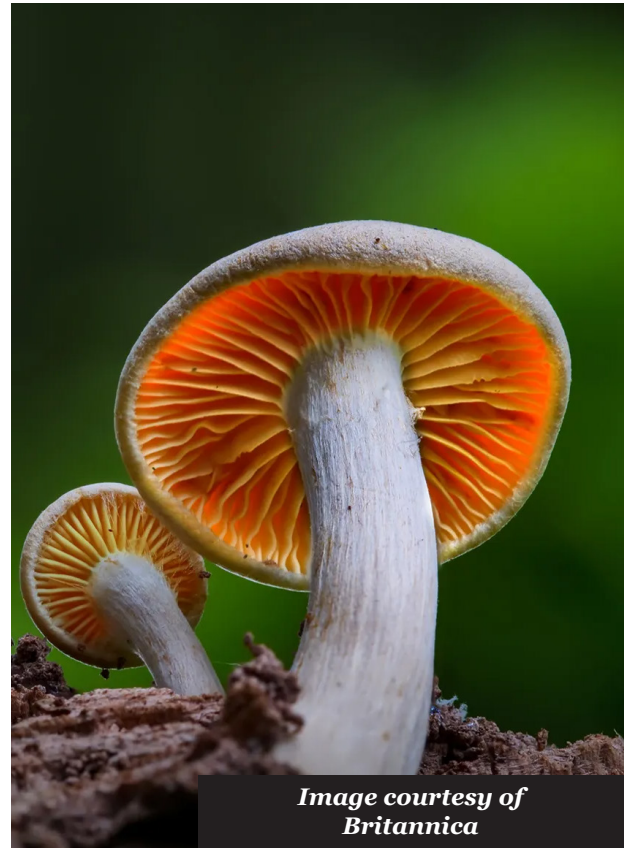
Image courtesy of Jan Erik Waide

Mushrooms, Spores, and Teeth: Oh My!

The mushrooms we think of when we think of fungus are the fruiting bodies of fungi, and are like an apple or a blueberry. If the mushroom is safe and edible, this is the part we eat.

Spores, on the other hand, are equivalent to seeds. The mushroom we see is formed to protect and produce spores- millions of them.

The mushroom is a highly specialized spore dispersal body formed in all shapes, sizes and colors. They release these spores through many different structures, such as pores, gills, and even teeth.



*Image courtesy of
Britannica*



*Image courtesy of
North Spore*

Fungi then spread through their spores which move through direct contact with other organisms or by the wind.

Wood chip mulch creates a good environment for fungi to thrive and fruit.

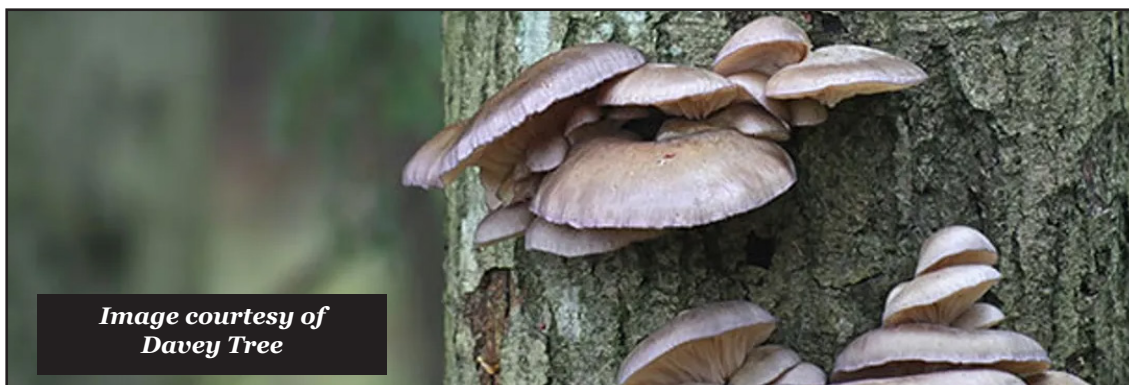
Different mushroom varieties can look very similar to the naked eye, so it is extremely important to only eat mushrooms that come from a trusted source, or grown at home!

Oyster Mushroom Overview



Oysters (*Plueterous* spp.) are a family of many species that exist on almost every continent in the world. They are the most adaptable mushroom, able to be grown on almost any organic material including logs, paper, sawdust, straw, and more.

For reliable production and commercial operations, they are most commonly grown on straw or on sawdust blocks supplemented with grain hulls. These methods rely on indoor “grow rooms,” which are clean spaces free of contaminants with regulated air flow, temperature, humidity, and light to offer the best results.



*Image courtesy of
Davey Tree*

At-Home Mushroom Growing Instructions

The steps to growing Oyster mushrooms on Straw or similar brittle, dry, and carbon rich materials:

Supplies you will need:

Oyster grain spawn**, Straw or similar brittle, dry, and carbon rich materials, Weed whacker, wood chipper or bale shredder for shredding the material, Plastic filter bag from supplier, or buckets, jars and other clean containers with holes for air exchange, Spray bottle of 70% isopropyl alcohol, Latex/plastic gloves

If Cold Water Fermentation Method is used:

Large container to soak straw in

If Hot Water Pasteurization Method is used:

Large pot to boil water in and soak straw in, Stove, Tongs, A cooling pan with holes to drain liquid, or a sheet

If Hydrated Lime Soak Method is used:

Hydrated lime, Large container to make hydrated lime water in and soak straw in, Protective gears such as gloves, safety glasses and mask, pH balancer

These supplies are all available from several mushroom suppliers.

See www.CornellMushrooms.org for a directory.



The steps to growing Oyster mushrooms on Straw or similar brittle, dry, and carbon rich materials:

1. Gather Materials

Straw (not hay) or any similar material that is dry, brown, and rich in carbon can be used for this method - many plant materials can be harvested and dried for this purpose. You can sometimes purchase or order pre-shredded straw online. Just make sure it isn't treated with anything.

2. Shred It!

It's best to shred your material into 1"-3" pieces before inoculating so that the mycelium can easily grow through it. Increasing the surface area through shredding increases yields by two times or more. You can cut or shred by hand, use a barrel and a weed whacker, or most efficient is a wood chipper or bale shredder.

3. Treat it!

The material needs to be treated in order to "clean" it of potential contaminants before inoculation. You can do one of several methods:

Cold Water Fermentation: Soak the material in cold water for 5 - 10 days until it goes anaerobic and "stinky." Drain off the water before inoculation.

Hot Water Pasteurization: Cook the material fully submerged in water for 2 hours at a minimum temperature of 140 - 160 degrees F, drain and cool before inoculating. With hot water, the straw needs to be quickly cooled on a rack or using a sheet before inoculation.

Hydrated Lime Soak: Soak the material in hydrated lime water for 16 hours before inoculation. The hydrated lime should contain less than 10% magnesium content and can be found at masonry or garden suppliers. To make the hydrated lime water, add 0.35 lbs of hydrated lime per gallon of water. It's best to test and ensure the hydrated lime water solution gets to at least 12 - 13pH. After soaking, drain off the water and the material is ready for inoculation. **The waste water should be pH balanced before disposal.**

***Direct contact with hydrated lime can cause skin burns, respiratory issues and eye irritations. Use proper protective equipment like gloves, mask and safety glasses to protect your skin, nose and eyes.**



*Image courtesy of
Wikicommons*



*Image courtesy of
Julia Soplop*

4. Inoculate and pack into containers

Once the straw is treated, it can be inoculated with spawn and packed into containers. Compress the inoculated material as much as possible. Wear gloves and spray any tools and surfaces with 70% isopropyl alcohol to reduce contamination. Bags, buckets, jars, or other clean containers can be used. Make sure there are holes on the containers for oxygen to get in.

5. Spawn Run

The spawn run takes about 3 - 4 weeks when the ambient air temperature is 60 - 70 degrees F. Keep the inoculated straw in a cool space without sealing off access to some fresh air, and keep the space dark. Mycelium will move through the straw and become full and firm when close to fruiting time.

6. Fruiting and Harvest

When the spawn run is complete, bring material into contact with more fresh air by cutting or opening more of the container to air. Increase light exposure, though not too much and avoid direct sunlight. Increase humidity and moisture by spritzing the container with a spray bottle several times a day, or use a humidifier. They are typically harvested with a sanitized knife or scissors and placed in stainless steel or food grade plastic containers. They should be picked when the cap is still curled under to ensure a long shelf life. After an initial flush and harvest, the material can and often will produce 2 - 3 more times after several weeks of rest.

7. Storage and Use

After harvest, mushrooms can be stored in a fridge for up to one week without losing flavor or texture. Fresh mushrooms are commonly used in soups, stir fry, and other dishes. It is recommended that mushrooms are always cooked prior to consumption, for a minimum of 1 - 3 minutes on high heat with oil or butter.

More information on oyster mushrooms can be found at: www.CornellMushrooms.org



Image courtesy of Todd Le



Image courtesy of Todd Le



Image courtesy of Bon Appetite Magazine

Recipe: Adrea Nguyen